

Comments on the larvae of the Argentine species of the genus *Crossodactylus* (Leptodactylidae, Hylodinae)

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The tadpole of *Crossodactylus schmidtii* is redescribed. Among other characteristics, the shape of the spiracle, the visibility of lateral line system, and the absence of a constriction behind the eyes differentiates it from the other known larvae of the genus. The tadpole previously referred to *Crossodactylus dispar* from Misiones, Argentina, is actually that of *Hyla semiguttata*.

INTRODUCTION

The 10 species in the genus *Crossodactylus* are distributed from northeastern Brazil to northern Argentina (CARCERELLI & CARAMASCHI, 1992; BASTOS & POMBAL, 1995). Two species were reported from Argentina: *Crossodactylus dispar* (LUTZ, 1925; type locality: "Fazenda do Bonito, Serra da Bocaina, São José do Barreiro, São Paulo, Brasil") and *Crossodactylus schmidtii* (GALLARDO, 1961; type locality: "Yacú-poi, sobre Rio Urugua-i, 30 km al E de Puerto Libertad, Misiones, Argentina").

The tadpole of *C. schmidtii* was briefly described by GALLARDO (1961) and its internal oral morphology was treated by WASSERSUG & HEYER (1988). The larva of *C. dispar* was described by CEI & ROIG (1961) and BOKERMANN (1963). The larvae of both species are scarce in Argentine collections and only consist of the material from which the original descriptions were based.

Recent field work in the province of Misiones, Argentina, and a review of the existing material in the collection of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" led to the discovery of some mistakes and confusions in the original descriptions of these larvae and suggested the need for a redescription of the tadpole of *Crossodactylus schmidtii*.

MATERIAL AND METHODS

All the studied material is deposited in the collection of the División Herpetología of the Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" (MACN). Measurements were taken according to LAVILLA & SCROCCHI (1986) with a "Max-Cal" digital calliper under a stereomicroscope. The terminology used for the description is that of VAN DIJK (1966), keratodont formulae are given according to DUBOIS (1995), and developmental stages were determined according to GOSNER (1960). Symbols used throughout the paper are: \bar{x} for the mean and s for the standard deviation.

The following specimens of *Crossodactylus schmidtii*, all from the province of Misiones (Argentina), were examined: MACN 2944 (10 larvae and a glass tube with eggs), Depto. Iguazu, Campamento Yacú-Poí, 30 km al este de Puerto Libertad, 10 February - 1 March 1951, collectors J. CRANWELL and J. M. GALLARDO, MACN 36757 (10 measured larvae), MACN 36758 (14 larvae), MACN 36759 (20 larvae) and MACN 36760 (23 larvae), Depto. Guarany, San Vicente, km 1272, Ruta Nacional 14, Campo Anexo INTA "Cuartel Rio Victoria", 21-23 January 1996, collectors J. FAIVOVICH, M. I. EVIA and D. ARRIETA.

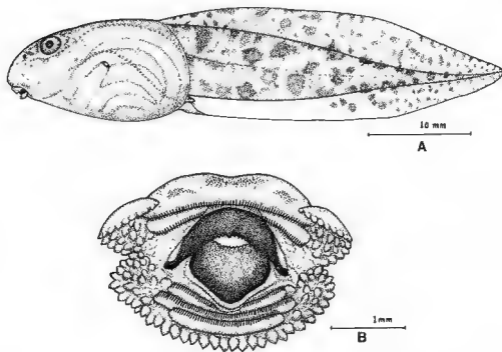


Fig 1 - Lateral view of the body (top) and oral disc (bottom) of a tadpole of *Crossodactylus schmidtii*, stage 31 (MACN 36757.1).

RESULTS

All the material studied by GALLARDO (1961) is deposited under the number MACN 2944. Of the ten tadpoles examined by GALLARDO, just three belong to *Crossodactylus schmidti*; the other seven are very similar to the larvae of *Hyla semiguttata* but differ from them by the absence of a keratodont row in the mental region (four rows instead of five). In spite of the previous identification of these larvae, it is very clear that they are not *C. schmidti*. This mixture in GALLARDO's material explains the observed ontogenetic variation in the number of keratodont rows commented upon by the author: "Dentary formulae: 1:1-1/4 (on larvae without limbs), 1:1-1/1-1:2 (on bigger larvae)". In this material, the larvae with a keratodont formula 1:1-1/4 are the "bigger larvae", and those with a formula 1:1-1/1-1:2 are the "larvae without limbs".

DESCRIPTION OF THE TADPOLE OF *CROSSODACTYLUS SCHMIDTI* (FIG. 1)

The preservation of the three tadpoles from GALLARDO's material is very poor. Therefore, for this redescription, recently collected material was used. The new material consists of 10 measured specimens (MACN 36767) plus additional specimens included under the numbers MACN 36758-60. Species identification of these tadpoles is based on the presence of an almost complete ontogenetic series (e.g., MACN 36760). Some measures are given in tab. 1.

Larvae between stages 31 and 36 have a total length ranging from 46.0 to 50.7 mm ($x = 48.6$, $s = 1.7$). The body is subovoid in dorsal view and slightly depressed in profile. The maximum width is located posterior to the spiracle, although in a few specimens the width is constant before and behind this location. The ventral contour of the body is convex; the branchial portion is flat. The snout is rounded in dorsal view and subovoid in profile. The lateral line system is visible.

The dorsolateral nostrils are subcircular or subovoid, with an epidermal rim less pigmented than the rest of the snout; the internarial distance is about equal to the distance between each nostril and the tip of the snout and is 1.8 times longer than the distance to the eyes. The diameter of the dorsolateral eyes equals 90 % of the interocular distance and 24 % of the body width at the level of the eyes.

The mouth is ventral and subterminal. The oral disc has intraangular margins; its width equals 34 % of the maximum body width. There is a rostral gap that equals 0.57 times the maximum width of the oral disc. The marginal papillae are conical, simple, and present in a single row, but in the mental portion they are biserial. On the immediately neighboring regions of the rostral gap, the papillae become progressively more rounded until they disappear. The intramarginal papillae have a conical shape, vary in size, and are irregularly distributed on the margins of the keratodont rows.

The keratodonts have a distribution that follows the formula 1:1+1/1+1:2. They have a subcylindrical shape and are completely keratinized. The free tips are curved orally and can be bi- or tricusped. The suprarostrodont is thickened medially and has thin lateral margins. It

Tab. 1. - Measurements (mm) of 10 larvae of *Crossodactylus schmidti* at stages 31- (MACN 36757). \bar{x} : mean; s : standard deviation.

| Measurement | $\bar{x} \pm s$ | Range |
|-----------------------------------|-----------------|-----------|
| Total length | 48.6 \pm 1.6 | 46.0-50.7 |
| Body length | 18.0 \pm 0.5 | 17.5-19.0 |
| Tail length | 30.8 \pm 1.7 | 27.9-33.7 |
| Maximum body height | 9.2 \pm 0.3 | 8.6-9.9 |
| Body width | 11.1 \pm 0.7 | 10.1-11.9 |
| Oral disc width | 3.8 \pm 0.3 | 3.5-4.5 |
| Rostral gap width | 2.2 \pm 0.1 | 2.1-2.4 |
| Extraocular distance | 5.8 \pm 0.3 | 5.4-6.4 |
| Left eye diameter | 2.2 \pm 0.1 | 2.0-2.3 |
| Internarial distance | 3.1 \pm 0.2 | 2.9-3.4 |
| Interocular distance | 2.5 \pm 0.2 | 2.3-2.8 |
| Maximum caudal fin height | 9.6 \pm 0.6 | 9.0-10.8 |
| Maximum caudal musculature height | 6.0 \pm 0.4 | 5.4-6.7 |
| Left eye - nostril distance | 1.7 \pm 0.1 | 1.5-1.8 |
| Body width (plane of nostrils) | 6.4 \pm 0.4 | 5.8-6.9 |
| Body width (plane of eyes) | 9.1 \pm 0.4 | 8.6-9.9 |
| Extranarial distance | 3.8 \pm 0.2 | 3.4-4.1 |
| Rostrospiracular distance | 10.4 \pm 0.5 | 9.9-11.2 |
| Rostronasal distance | 2.9 \pm 0.2 | 2.5-3.1 |

is heavily pigmented with the exception of the superior lateral margins where pigmentation is absent. The free margin is concave and bears serrations with highly variable distribution; in some specimens they cover the whole free margin, while in others they are developed only on the medial portion. In many larvae the serration that is located in the center of the free margin is larger than the others. The infrarostrodont is a massive and heavily pigmented structure of uniform width. The free margin is concave and completely serrated with serrations of irregular sizes.

The spiracle is sinistral and visible dorsally, it arises below the mid-line of the body and is oriented posterodorsally. The aperture is oval. The rostrspiracular distance is 0.57 times the body length.

The tail length equals 0.63 times the total length and 1.7 times the body length. The maximum height of the caudal musculature is less than the maximum body height. The caudal fin height is about equal to the maximum body height. The ventral fin is subparallel to the longitudinal body axis and is curved at the distal third of the tail; the dorsal fin is curved. Both fins originate at the base of the tail, the dorsal fin is higher than the ventral. The proctodeal tube is dextral and oriented posteriorly; it is conical in shape and has a circular aperture; it covers the origin of the ventral fin.

In life, the dorsum of the brownish tadpoles varies in a pattern that is very similar to the bottom of the streams. The tail is lighter than the body and has dark, irregular mottling on the musculature, dorsal fin, and the distal third of the ventral fin. Ventrally, the visceral and branchial structures are visible through the skin.

The larvae were collected in shallow forest streams; the bottom was alternatively covered by stones or lime. The tadpoles were syntopic with larvae of *Hyla semiguttata*.

THE TADPOLE OF *CROSSODACTYLUS DISPAR*

The larva of *Crossodactylus dispar* was described by CEI & ROIG (1961) from material collected in San Pedro, Misiones, Argentina, and later by BOKERMANN (1963) from material from Paranapiacaba, São Paulo, Brasil (without any reference to the former paper). Looking at the illustrations presented, it soon becomes clear that the larvae assigned to *C. dispar* in these two publications are very different. In fact, all the subsequent Brazilian authors that have treated the larvae of the genus (e.g., FRANCIONI & CARCERELLI, 1993) referred to the paper of BOKERMANN and omitted that by CEI & ROIG (1961).

CEI & ROIG (1961) based their description on five specimens that are now housed in the collection of the Instituto de Biología Animal, Universidad Nacional de Cuyo (IBA-UNC) and could not be examined. However, from the description and illustrations presented by them and by CEI (1980), it can be seen that the oral disc of at least the same tadpole that was illustrated in each paper is very similar, both in the distribution of papillae on the angular zone and in the keratodont row formula, to that of the tadpole of *Hyla semiguttata* (see FAIVOVICH, 1996). The only differences can be attributed to the quality of the drawings. The other four tadpoles probably do not belong to *Crossodactylus*.

Finally, the identity of the specimen on which WASSERSUG & HEYER (1988) described the oral cavity of the larvae of *Crossodactylus schmidtii* should be reviewed. These authors stated that the specimen was identified with the description of the larva of this species given by CEI (1980), who was following GALLARDO (1961), and therefore its identity is likely to be confused.

DISCUSSION

The larvae of five *Crossodactylus* species have been described so far: *Crossodactylus bokermanni* (CARAMASCHI & SAZIMA, 1985); *Crossodactylus dispar* (BOKERMANN, 1963); *Crossodactylus gaudichaudii* (FRANCIONI & CARCERELLI, 1993); *Crossodactylus schmidti* (this paper), *Crossodactylus trachystomus* (CARAMASCHI & KISTEUMACHER, 1989). FRANCIONI & CARCERELLI (1993) did a careful comparison between the tadpole of *C. gaudichaudii* and the other known larvae. Probably because they only had the description of GALLARDO (1961), these authors stated that they did not find differences between the tadpoles of *C. gaudichaudii* and *C. schmidti*.

According to the characterization given here, the tadpole of *C. schmidti* is differentiated from that of *C. gaudichaudii* by the presence of pigmentation on the ventral fin and visible lateral line (also, in the illustration presented by FRANCIONI & CARCERELLI, 1993, the rostral gap seems to be wider than in *C. schmidti*). In comparison with the other known larvae, it differs from the tadpoles of *C. trachystomus* and *C. bokermanni* by the shape of the spiracle (according to the respective illustrations, in these species it would be subtriangular whereas in *C. schmidti* it has a cylindrical shape); also as indicated in the corresponding illustration (there are no references in the description), the tadpole of *C. bokermanni* possesses no intramarginal papillae. Lastly, the absence of a constriction behind the eyes easily differentiates the larva of *C. schmidti* from that of *C. dispar*.

CARAMASCHI & KISTEUMACHER (1989) stated that the larvae of the genus *Crossodactylus* are poorly differentiated morphologically. The comparisons made by FRANCIONI & CARCERELLI (1993) and the one presented above clearly indicate that the larvae of *Crossodactylus* have characters that can be potentially useful for the diagnosis of the different species.

RESUMEN

Se redescubre la larva de *Crossodactylus schmidti*. Entre otros caracteres, la forma del espiráculo, la línea lateral visible y la ausencia de una constricción detrás de los ojos permite diferenciarla de las otras larvas conocidas del género. El material de larvas previamente asignado a *C. dispar* de Misiones, Argentina, corresponde a *Hyla semiguttata*.

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